

## ABSTRACT

Non-binary methods of computing utilizing a digital multistate phase change material. Addition, subtraction, multiplication, and division are accomplished with the controlled application of energy to a phase change material. In one embodiment, energy in an amount insufficient to set the reset state of a phase change material is provided to store one or more numbers and further energy characteristic of the performance of a mathematical operation is provided to effect a computation. The set energy of the reset state of a phase change material provides an interval of energy that may be used to define programming states along the high resistance portion of the electrical resistance response curve of a phase change material. By subdividing this interval of energy, a plurality of programming states can be defined which are distinguishable in energy relative to the reset state. Numerical values can be assigned to the programming states and computations in non-binary arithmetic bases can be completed by providing energy to effect controlled transformations between programming states. In one embodiment, methods for computing with multidigit numbers are completed by storing separate digits in registers comprised of a phase change material, where each register corresponds to a particular place value. Memory groups comprised of registers can be defined where each memory group corresponds to the set of registers storing the digits of a multidigit number. Addition, subtraction, multiplication and division can be performed through selective register by register operations.